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IS : 8080 - 1976

Indian Standard

SPECIFICATION FOR SILVER COATED COPPER WIRE

UDC 621·315·55 : [669·3-426 2 , 669 228] : 621·38/ 39·038

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1976

AMENDMENT NO. 1 JULY 1987

TO

IS : 8080-1976 SPECIFICATION FOR SILVER COATED COPPER WIRE

(*Page* 3, *clause* 3.2.1, *line* 2) — Substitute 'polysulphide test' *for* 'persulphate test'.

(*Page* 4, *Table* 1, *first row*) — Add the following entries before this row:

TABLE 1 REQUIREMENTS FOR SILVER COATING

DIAMETER OF WIRE ON WHICH SILVER IS COATED	TOLERANCE	THICKNESS OF SILVER COATING		
		Type A	Type B	Type C
(1)	(2)	(3)	(4)	(5)
mm	mm	micron	micron	micron
0·050	—	—	—	—
0·063	—	—	—	—
0·071	0·003	—	—	—
0·080	0·003	—	—	—
0·090	0·003	—	—	—
0·100	0·003	—	—	—
0·112	0·003	—	—	—
0·125	0·003	—	—	1·05
0·140	0·003	—	—	1·18
0·160	0·003	—	—	1·35
0·180	0·003	—	—	1·52
0·200	0·003	—	1·05	1·58
0·224	0·003	—	1·18	1·88
0·250	0·004	—	1·32	2·11
0·280	0·004	—	1·47	2·36
0·315	0·004	—	1·66	2·66
0·355	0·004	—	1·88	3·00
0·400	0·005	1·06	2·12	3·39
0·450	0·005	1·18	2·38	3·81

(*Page* 5, *Table* 2, *first row*) — Add the following entries before this row:

TABLE 2 ELECTRICAL RESISTANCE OF SILVER COATED COPPER WIRE

Diameter of Silver Coated Wire	Tolerance	Resistance per Metre at 20°C in Ohms		
		Nominal	Maximum	Mimimum
(1)	(2)	(3)	(4)	(5)
mm	mm			
0·050	—	8·781	9·559	7·903
0·063	—	5·531	6·029	5·033
0·071	0·003	4·355	4·725	3·985
0·080	0·003	3·430	3·704	3·156
0·090	0·003	2·710	2·913	2·507
0·100	0·003	2·195	2·349	2·041
0·112	0·003	1·750	1·864	1·646
0·125	0·003	1·405	1·488	1·328
0·140	0·003	1·120	1·180	1·064
0·160	0·003	0·857 5	0·898 3	0·819 2
0·180	0·003	0·677 5	0·706 8	0·649 9
0·200	0·003	0·548 8	0·570 6	0·528 2
0·224	0·003	0·437 5	0·453 4	0·422 4
0·250	0·004	0·351 2	0·365 9	0·337 4
0·280	0·004	0·280 0	0·290 7	0·269 8
0·315	0·004	0·221 2	0·228 9	0·213 9
0·355	0·004	0·174 2	0·179 7	0·168 9
0·400	0·005	0·137 2	0·141 9	0·132 7
0·450	0·005	0·108 4	0·111 8	0·105 1

(*Pages* 10 *and* **11**, *clause* **6.5.1**) — Substitute the following for the existing clause:

'**6.5.1** *Continuity of Coating*

Note — The continuity of coating shall be determined on representative samples taken before stranding or insulating and shall be determined by the sodium polysulfide test. Wire whose coating wieght corresponds to a thickness less than 1·02 micron shall not be subject to this test.

6.5.1.1 *Specimens*

a) *Length of specimens* — Test specimens shall each have a length of about 150 mm. They shall be tagged or marked to correspond with the coil, spool, or reel from which they were cut.

b) *Treatment of specimens* — Thoroughly clean the specimens by immersion in a suitable organic solvent such as benzene, ether, or trichloroethylene for at least 3 min; then remove and wipe dry with a clean, soft cloth (Caution: *see* Note). Keep the specimens thus cleaned wrapped in a clean, dry cloth until tested. Do not handle that part of the specimen to be immersed in the test solution. Take care to avoid abrasion by the cut ends.

Note — *Caution* — Consideration should be given to toxicity and flammability when selecting solvent cleaners.

6.5.1.2 *Special solutions*

a) *Sodium polysulphide solution (sp gr 1·142)* — Make a concentrated solution by dissolving sodium sulphide crystals (cp) in distilled water until the solution is saturated at about 20°C, and adding sufficient flowers of sulphur (in excess of 250 g/litre of solution) to provide complete saturation, as shown by the presence in the solution of an excess of sulphur after the solution has been allowed to stand for at least 24 h. Make the test solution by diluting a portion of the concentrated solution with distilled water to a specific gravity of 1·142 at 15·6°C. The sodium polysulphide test solution should have sufficient strength to blacken thoroughly a piece of clean uncoated copper wire in 5 s. A portion of the test solution used for testing samples shall not be considered to be exhausted until it fails to blacken a piece of clean copper as described above.

> NOTE — It is important that the polysulphide solution be of a proper composition and strength at the time of test. A solution which is not saturated with sulphur or which has been made from decomposed sodium sulphide crystals may give a false indication of failure. Therefore, the requirement that the solution be tested by observing its blackening effect on a bright copper wire is significant. Significant also is the requirement that the solution be saturated with sulphur by allowing the solution to stand at least 24 h after preparation. Attention is called also to the necessity for the use of sodium sulphide which has not deteriorated through exposure to air; and if exposure has occurred, the crystals should be tested for purity.

b) *Hydrochloric acid solution (sp gr 1·088)* — Dilute commercial HCl (sp gr 1·12) with distilled water to a specific gravity of 1·088 measured at 15·6°C. A portion of the HCl solution having a volume of 180 ml shall be considered exhausted if it fails to remove within 15 s the discolouration of the silver due to the polysulphide immersion.

6.5.1.3 *Procedure*

a) *Immersion in polysulphide solution* — Immerse a length of at least 110 mm from each of the clean specimens for 30 s in the sodium polysulphide solution, described in **6.5.1.2** (a), maintained at a temperature between 15·6 and 20°C.

b) *Washing* — After the immersion, thoroughly wash the specimens in clean water and wipe dry with a clean, soft cloth.

c) *Immersion in hydrochloric acid* — After washing, immediately immerse the specimen for 15 s in the HCl solution described in **6.5.1.2** (b) thoroughly wash in clean water, and wipe dry with a clean, soft cloth.

d) *Examination of specimens* — After immersion and washing examine the specimens to ascertain if copper exposed through openings in the silver coating has been blackened by action of the sodium polysulphide. Examine the specimen with the unaided eye (normal spectacles excepted) against a white background. The specimens shall be considered to have failed if, by such blackening exposed copper is revealed. No attention shall be paid to blackening within 12·7 mm of the cut end.

6.5.1.4 *Conformance criteria* — The continuity of the coating of each of the eight specimens shall conform to the requirements of **3.2.1**. Failure of more than two specimens shall constitute failure to meet the continuity criterion. If not more than two specimens fail to meet the continuity criteria, eight additional specimens from the lot shall be tested, all of which shall conform to the continuity criteria. However, any individual production unit, the specimen from which failed to meet the continuity criteria, shall be rejected.

NOTE — Cumulative results secured on the product of a single manufacturer, indicating continued conformance to the criteria, are necessary to ensure an overall product meeting the requirements of this specification The sample size and conformance criteria given for the various characteristics are applicable only to lots produced under these conditions.

(LTDC 18)

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Indian Standard

SPECIFICATION FOR SILVER COATED COPPER WIRE

Cables, Wires and Waveguides for Telecommunication Equipment Sectional Committee, LTDC 11

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Indian Standard

SPECIFICATION FOR SILVER COATED COPPER WIRE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 15 June 1976, after the draft finalized by the Cables, Wires and Waveguides for Telecommunication Equipment Sectional Committee had been approved by the Electronics and Telecommunications Division Council.

0.2 This standard covers the requirements and methods of tests for silver coated round copper wire for use in coils and cables employed in electronic and telecommunication equipment.

0.3 Silver coated copper wire find use in coils used at radio frequency and also as conductors in RF cables. As the silver coating on the base metal is expected to meet certain specific requirements, such as conductivity and adequate thickness so as to support the radio frequency current, necessity for specifying the performance requirements of silver coated copper wire has been felt.

0.4 While preparing this standard assistance has been derived from ASTM B 298-74 ' Silver-coated soft or annealed copper wire ' issued by the American Society for Testing and Materials.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers requirements and method of tests for silver coated round copper wire for use in coils and cables employed in electronic and telecommunication equipment.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions in addition to those given in IS : 1591-1960†, shall apply.

---

* Rules for rounding off numerical values (*revised*).

† Glossary of terms for electrical cables and conductors.

2.1 Type Tests — Tests carried out to prove conformity with the requirements of this standard. These are intended to check the general quality and design of a given sample of silver coated copper wire.

2.2 Acceptance Tests — Tests carried out on samples selected from a lot for the purpose of acceptance of the lot.

2.3 Routine Tests — Tests carried out on the silver coated wire to check the requirements which are likely to vary during production.

3. MATERIALS AND CONSTRUCTION

3.1 Conductor

3.1.1 The conductor on which silver is to be coated shall be of high conductivity annealed copper having the properties given in **3.1.2** of IS: 4800 (Part I)-1968*.

3.1.2 *Diameter* — The diameters and tolerances on diameters of the finished wire shall be in accordance with Table 1.

3.1.3 *Resistance* — The resistance of conductor at 20°C shall be in accordance with Table 2.

3.1.3.1 *Multiplier constant* — Table 3 gives the values of multiplier constants for converting resistances at various temperatures to the resistance at 20°C and the reciprocals of the constants for converting resistance at 20°C to other temperatures.

3.2 Details of Coating

3.2.1 *Continuity* — The silver coating shall be continuous. The continuity of coating shall be determined by the persulphate test as specified in **6.5.1**.

3.2.2 *Mass* — The mass of coating expressed in percentage of the total mass of the wire shall not be less than that specified in **4.1**.

3.3 Finish — The coating shall be smooth, continuous and free from slivers, spills and cracks, and firmly adherent to the surface of copper. The wire shall be bright and free from all imperfections.

4. GRADES

4.1 The silver coated copper wire shall be of the following grades based on the mass of silver coating:

Grade	*Percentage Mass of Silver Coating, Min*
A	1·25
B	2·5
C	4·0

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* Specification for enamelled round winding wires: Part I Conductor data.

TABLE 1 REQUIREMENTS FOR SILVER COATING

(*Clauses* 3.1.2 *and* 4.2)

DIAMETER OF WIRE ON WHICH SILVER IS COATED	TOLERANCE	THICKNESS OF SILVER COATING		
		Type A	Type B	Type C
(1)	(2)	(3)	(4)	(5)
mm	mm	micron	micron	micron
0·50	±0·005	1·33	2·69	4·35
0·56	±0·006	1·49	3·01	4·89
0·63	±0·006	1·69	3·41	5·50
0·71	±0·007	1·90	3·78	6·20
0·75	±0·008	2·04	4·04	6·55
0·80	±0·008	2·13	4·31	6·99
0·85	±0·009	2·26	4·58	7·42
0·90	±0·009	2·40	4·85	7·83
0·95	±0·010	2·53	5·10	8·28
1·00	±0·010	2·67	5·39	8·74
1·06	±0·011	2·80	5·80	9·25
1·12	±0·011	2·95	6·00	9·75
1·18	±0·012	3·23	6·33	10·31
1·25	±0·013	3·32	6·73	10·70
1·32	±0·013	3·57	7·11	11·59
1·40	±0·014	3·74	7·54	12·91
1·50	±0·015	4·01	8·05	13·11
1·60	±0·016	4·27	8·62	13·98
1·70	±0·017	4·53	9·16	14·85
1·80	±0·018	4·84	9·71	15·91
1·90	±0·019	5·08	10·24	16·61
2·00	±0·020	5·34	10·78	17·34
2·12	±0·021	5·71	11·42	18·52
2·24	±0·022	5·98	12·06	19·57
2·36	±0·024	6·30	12·72	20·62
2·50	±0·025	6·67	13·47	21·84
2·65	±0·027	7·07	14·29	23·18
2·80	±0·028	7·48	15·08	24·42
3·00	±0·030	7·99	16·13	26·15
3·15	±0·032	8·49	16·99	27·53
3·35	±0·034	8·95	18·10	29·30
3·55	±0·036	9·50	19·15	31·05
3·75	±0·038	10·00	20·25	32·75
4·00	±0·040	10·70	21·60	34·95

TABLE 2 ELECTRICAL RESISTANCE OF SILVER COATED COPPER WIRE

(*Clause* 3.1.3)

Diameter of Silver Coated Wire	Tolerance	Resistance per Metre at 20°C in ohms		
		Nominal	Maximum	Minimum
(1)	(2)	(3)	(4)	(5)
mm	mm			
0·50	±0·005	0·087 81	0·090 37	0·085 34
0·56	±0·006	0·070 00	0·072 15	0·067 94
0·63	±0·006	0·055 31	0·056 87	0·053 81
0·71	±0·007	0·043 55	0·044 81	0·042 34
0·75	±0·008	0·039 03	0·040 22	0·037 88
0·80	±0·008	0·034 30	0·035 30	0·033 34
0·85	±0·009	0·030 38	0·031 31	0·029 50
0·90	±0·009	0·027 10	0·027 89	0·026 34
0·95	±0·010	0·024 32	0·025 06	0·023 62
1·00	±0·010	0·021 95	0·022 59	0·021 34
1·06	±0·011	0·019 54	—	—
1·12	±0·011	0·017 50	—	—
1·18	±0·012	0·015 77	—	—
1·25	±0·013	0·014 05	—	—
1·32	±0·013	0·012 60	—	—
1·40	±0·014	0·011 20	—	—
1·50	±0·015	0·009 757	—	—
1·60	±0·016	0·008 575	—	—
1·70	±0·017	0·007 596	—	—
1·80	±0·018	0·006 775	—	—
1·90	±0·019	0·006 081	—	—
2·00	±0·020	0·005 488	—	—
2·12	±0·021	0·004 884	—	—
2·24	±0·022	0·004 375	—	—
2·36	±0·024	0·003 941	—	—
2·50	±0·025	0·003 512	—	—
2·65	±0·027	0·003 126	—	—
2·80	±0·028	0·002 800	—	—
3·00	±0·030	0·002 439	—	—
3·15	±0·032	0·002 212	—	—
3·35	±0·034	0·001 956	—	—
3·55	±0·036	0·001 742	—	—
3·75	±0·038	0·001 561	—	—
4·00	±0·040	0·001 372	—	—

TABLE 3 MULTIPLIER CONSTANTS FOR CONVERTING RESISTANCES AT VARIOUS TEMPERATURES TO THE STANDARD TEMPERATURE OF 20°C AND RECIPROCALS OF THE CONSTANTS FOR CONVERTING RESISTANCES AT 20°C TO OTHER TEMPERATURES

(*Clause* 3.1 3.1)

TEMPERATURE	COPPER	
	Multiplier Constant	Reciprocal of Constant
(1) °C	(2)	(3)
10·0	1·041	0·960 7
10·5	1·039	0·962 7
11·0	1·037	0·964 6
11·5	1·035	0·966 6
12·0	1·032	0·968 6
12·5	1·030	0·970 5
13·0	1·028	0·972 5
13·5	1·026	0·974 5
14·0	1·024	0·976 4
14·5	1·022	0·978 4
15·0	1·020	0·980 4
15·5	1·018	0·982 3
16·0	1·016	0·984 3
16·5	1·014	0·986 2
17·0	1·012	0·988 2
17·5	1·010	0·990 2
18·0	1·008	0·992 1
18·5	1·006	0·994 1
19·0	1·004	0·996 1
19·5	1·002	0·998 0
20·0	1·000	1·000
20·5	0·998 0	1·002
21·0	0·996 1	1·004
21·5	0·994 1	1·006
22·0	0·992 2	1·008
22·5	0·990 3	1·010
23·0	0·988 3	1·012
23·5	0·986 4	1·014
24·0	0·984 5	1·016
24·5	0·982 6	1·018
25·0	0·980 7	1·020
25·5	0·978 8	1·022
26·0	0·977 0	1·024
26·5	0·975 1	1·026
27·0	0·973 2	1·028
27·5	0·971 4	1·030
28·0	0·969 5	1·031
28·5	0·967 7	1·033
29·0	0·965 8	1·035
29·5	0·964 0	1·037
30·0	0·962 2	1·039
30·5	0·960 4	1·041
31·0	0·958 6	1·043
31·5	0·956 8	1·045

(*Continued*)

TABLE 3 MULTIPLIER CONSTANTS FOR CONVERTING RESISTANCES AT VARIOUS TEMPERATURES TO THE STANDARD TEMPERATURE OF 20°C AND RECIPROCALS OF THE CONSTANTS FOR CONVERTING RESISTANCES AT 20°C TO OTHER TEMPERATURES — *Contd*

TEMPERATURE	COPPER	
	Multiplier Constant	Reciprocal of Constant
(1)	(2)	(3)
°C		
32 0	0 955 0	1 047
32 5	0 953 2	1 049
33 0	0 951 4	1 051
33 5	0 949 6	1 053
34 0	0 947 8	1 055
34 5	0 946 1	1 057
35 0	0 944 3	1 059
35 5	0 942 6	1 061
36 0	0 940 8	1 063
36 5	0 939 1	1 065
37 0	0 937 4	1 067
37 5	0 935 7	1 069
38 0	0 933 9	1 071
38 5	0 932 2	1 073
39 0	0 930 5	1 075
39 5	0 928 8	1 077
40 0	0 927 1	1 079
40 5	0 925 4	1 081
41 0	0 923 8	1 082
41 5	0 922 1	1 084
42 0	0 920 4	1 086
42 5	0 918 8	1 088
43 0	0 917 1	1 090
43 5	0 915 5	1 092
44 0	0 913 8	1 094
44 5	0 912 2	1 096
45 0	0 910 5	1 098
45 5	0 908 9	1 100
46 0	0 907 3	1 102
46 5	0 905 7	1 104
47 0	0 904 1	1 106
47 5	0 902 5	1 108
48 0	0 900 9	1 110
48 5	0 899 3	1 112
49 0	0 897 7	1 114
49 5	0 896 1	1 116
50 0	0 894 5	1 118

NOTE 1 — The values given in this table have been calculated to six significant figures and rounded off to four significant figures.

NOTE 2 — Given the resistance of a wire at t°C, the resistance at 20 °C is found by multiplying the resistance at t°C by the constant for t°C, given in col 2 Conversely, given the resistance at 20°C, the corresponding resistance at t°C is found multiplying the resistance at 20°C by the reciprocal for t°C, given in col 3

4.2 The thickness of silver coating in microns for the above grades is given in Table 1 (*for information only*).

5. PACKING AND MARKING

5.1 The wire shall be wound evenly and compactly on reels complying with IS : 482-1968*.

5.2 The label which shall be attached to the reel shall have the following information:

a) Manufacturer's name or trade-mark or both,
b) Grade,
c) Diameter of wire, and
d) Mass of wire.

5.2.1 The label may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6. TESTS

6.1 Classification of Tests

6.1.1 *Type Tests* — The following shall constitute the type tests:

a) Resistance (**6.4.1**),
b) Dimension (**6.3.1**),
c) Elongation (**6.3.2**),
d) Continuity of coating (**6.5.1**), and
e) Mass of silver coating (**6.5.2**).

6.1.1.1 *Number of samples* — Under consideration.

6.1.1.2 *Acceptance criteria* — Under consideration.

6.1.2 *Acceptance Tests* — The following shall constitute the acceptance tests:

a) Dimension (**6.3.1**),
b) Mass of silver coating (**6.5.2**), and
c) Continuity of coating (**6.5.1**).

---

*Specification for reels for covered, round electrical winding wires (*second revision*).

6.1.2.1 A recommended sampling plan and acceptance criteria is given in Appendix A.

6.1.3 *Routine Test* — The checking of dimension (**6.3.1**) shall constitute the routine test.

6.2 Conditions for Tests

6.2.1 *Standard Atmospheric Conditions for Testing* — Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions stipulated in IS : 589-1961*.

6.2.2 *Preconditioning* — All the electrical measurements shall be carried out after storing the wires or cables at the test temperature for a time sufficient for the whole of the wires or cables to reach that temperature.

6.3 Mechanical Tests

6.3.1 *Dimension*

6.3.1.1 *Diameter* — The measurement shall be made with an accuracy better than 0·002 mm.

6.3.1.2 If a micrometer is used it shall be ensured that the measuring force is in the range of 0·75 to 1·25 N. The spindle and the anvil of the micrometer shall have a diameter of 5 to 8 mm.

6.3.1.3 Measurements shall be carried out at three equidistant places around the circumference of the conductor. The average of the readings shall be recorded as the conductor diameter.

NOTE — For wires having a diameter greater than 0·5 mm a force between 1 and 3 N may be used.

6.3.2 *Elongation* — The elongation at break shall be measured in a suitable tensile test machine. The free measuring length shall be between 200 and 300 mm. The wire shall be stretched at the rate of not more than 300 mm/minute. The elongation at break shall be expressed as a percentage of the free measuring length. Three measurements shall be made and the mean value shall be taken as elongation.

6.4 Electrical Test

6.4.1 *Resistance* — The resistance of the wire shall be expressed as the dc resistance at 20°C. The method used shall have an accuracy of 0·5 percent.

NOTE — If the resistance is measured at any temperature t°C other than 20°C, the resistance R_{20} at 20°C shall be calculated from the following formula:

$$R_{20} = \frac{R_t}{1+\alpha(t-20)}$$

where

t = the actual temperature in °C during the measurement, and

α = temperature coefficient which is 0·003 93 for silver-coated copper.

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* Basic climatic and mechanical durability tests for electronic components (*revised*).

6.5 Chemical Tests

6.5.1 *Continuity of Coating*

6.5.1.1 *Preparation of test specimens* — A suitable length of wire shall be cut from the sample without causing damage to the coating and marked 4 cm from each end by means of a grease pencil or in some other manner which will not cause damage to the coating.

The test specimen shall be wound into one helix upon a smooth mandrel of diameter as to ensure no twisting moment being imparted to the wire. The diameters of the mandrel to be used shall be as given in the following table:

Diameter of Wire	*Diameter of Mandrel*
mm	mm
Up to 1 12	38
Above 1 12 up to 1 4	51
Above 1 4 up to 1 8	56
Above 1 8 up to 2	64
Above 2 up to 2 8	70
Above 2 8	76

Those portions of the test specimens which are necessary to lead up to the 4 cm ends and provide for their projection above the surface of the testing solution in which the specimens are to be immersed shall not be formed to the mandrel, but shall be suitably bent for the purpose. Such bending, however, shall not entail a radius of less than half the diameter of the mandrel used to produce the helix.

The helix shall be removed from the mandrel by slipping it off endwise without further distortion of the wire.

A cleaning operation shall be carried out after the test helix has been removed from the mandrel and immediately prior to its immersion in the test solution. The part to be immersed shall not be handled.

The method of cleaning shall consist in the immersion of test helix for a period of 10 seconds in a suitable solvent, for example, chloroform or methylated ether contained in one vessel followed by a similar period of immersion in solvent contained in a second vessel, the helix to be agitated during each immersion and to be allowed to dry before immersion in the test solution. Should the colouration of the solvent due to dissolved material become discernible, the solvent shall be renewed, care being taken to ensure that the vessel containing the cleaner liquid is used for the second (and final) wash.

6.5.1.2 *Preparation of testing solutions* — The testing solutions shall be prepared as follows:

a) *Persulphate solution* — Dissolve 10 g of fresh crystalline ammonium persulphate in distilled water, add 20 ml of 0 880 N ammonium hydroxide solution and make up to 1 litre with distilled water.

b) *Standard colour reagent* — Dissolve 3 927 g of pure copper sulphate ($CuSO_4$, 5 H_2O) and 50 ml of 0 880 N ammonium hydroxide solution in distilled water and make up to one litre with distilled water. One millilitre of this solution is equivalent to 0 001 g of copper.

6.5.1.3 *Immersion for test* — After cleaning, the helix shall be immersed for 10 minutes in a vessel containing the persulphate solution described in **6.5.1.2**(a) in such a manner that the surface of the wire between the marks is exposed to the testing solution and the 4 cm ends project above the surface thereof.

The test shall be carried out under normal room temperature conditions, but immediately prior to immersion of the helix, the test solution shall be brought to a temperature of 18 ± 1°C The volume of the solution shall be as follows:

Up to and including 1 8 mm diameter	75 ml
Above 1 8 mm diameter	200 ml

6.5.1.4 *Determination of mass of copper dissolved* — The mass of copper dissolved from the wire by persulphate solution shall be determined colorimetrically by comparison with the standard colour reagent [*see* **6.5.1.2**(b)]. The mass is expressed as milligrams of copper per square decimetre of wire immersed.

6.5.1.5 *Requirement* — If the result obtained under **6.5.1.4** does not exceed 30 milligrams per square decimetre, the coating shall be regarded as satisfactory.

If the result for one group exceeds the limiting value indicated above, the test shall be repeated on a fresh group comprised of specimens cut from the same wires from which the original defective group was taken, in order to ensure that the failure is not due purely to 'end effect'.

If this additional group fails to pass the test, the wire represented by this sample may be rejected.

6.5.2 *Determination of Mass of Silver Coating* — The mass of silver coating shall be determined gravimetrically.

6.5.2.1 *Apparatus*

a) Beaker — 600 ml of chemically resistant glass (*see* IS : 2619-1971[*]).

b) Sintered glass crucible (G No. 4).

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[*] Specification for glass beakers (*first revision*).

6.5.2.2 *Reagents*

a) Dilute nitric acid (1 : 4).

b) Nitric acid wash solution (1 : 99).

c) Sodium chloride solution (100 g NaCl per litre).

d) Alcohol wash solution (1 : 1).

NOTE — The alcohol wash solution may be obtained by mixing equal volumes of special denatured alcohol and water.

6.5.2.3 *Procedure* — Weigh, to the nearest 0.1 mg, a portion of the sample of silver coated wire of a length equivalent to 10 to 40 mg of silver. Transfer the sample to a 600-ml chemically resistant glass beaker and add 20 ml of dilute nitric acid (1 : 4) per gram of sample, and boil to expel brown fumes. Dilute the solution with distilled water using approximately 50 ml of water per gram of sample. Heat to boiling, remove from the hot-plate, and add slowly, with rapid stirring, 10 ml of sodium chloride solution. Boil the solution 2 to 3 minutes to coagulate the silver chloride precipitate. Allow to cool and settle the precipitate.

Filter, using a sintered glass crucible No. 4. Wash free of copper salts with nitric acid wash solution, followed by 2 to 4 washings with alcohol wash solution. Dry in an oven at 205°C to constant mass. Cool and weigh as silver chloride (AgCl).

6.5.2.4 Calculate the mass of the coating as a percentage of the total mass of the wire as below:

$$\text{Silver, percent} = \frac{A \times 0.752\,6}{B} \times 100$$

where

A = mass of silver chloride in g, and

B = mass of sample used in g.

APPENDIX A

(*Clause* 6.1.2.1)

SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

A-1. LOT

A-1.1 In any consignment, all the reels (or drums) of coils of silver coated copper wire of the same type, category and manufactured from the same material under essentially similar conditions of production shall be grouped together to constitute a lot.

A-2. SCALE OF SAMPLING

A-2.1 Tests for ascertaining the conformity of the lot to the requirements of the standard shall be done for each lot separately. For this purpose the number of reels or coils to be selected at random from a lot shall be in accordance with col 1 and 2 of Table 4.

TABLE 4 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES

Lot Size (No of Reels/Coils in the Lot)	Scale A		Scale B	
	No. of Reels/ Coils to be Selected in the Sample	Permissible No. of Defectives	No. of Reels/ Coils to be Selected in the Sample	Permissible No. of Defectives
(1)	(2)	(3)	(4)	(5)
Up to 300	20	2	13	0
301 to 500	32	3	20	0
501 to 1 000	50	5	32	0
1 001 to 3 000	80	7	50	1
3 001 and above	125	10	80	2

A-3. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-3.1 From each of the reels or coils selected according to **A-2.1** suitable lengths of test samples shall be taken after discarding approximately 1.5 metre of the wire from both ends. These test samples shall be subjected to each of the tests for dimension and test for mass of coating. If the number of test samples not fulfilling the requirements of any of the tests is less than or equal to the corresponding permissible number given in col 3 of Table 4, the lot shall be declared as conforming to the requirements of these tests.

A-3.2 For the characteristic continuity of coating, the number of tests to be carried out and the permissible number of defectives shall be in accordance with col 4 and 5 of Table 4.

A-3.3 The lot should be declared as conforming to the specifications if **A-3** and **A-3.1** are satisfied.

Note 1 — The test samples for carrying out the test under Scale B of Table 4 may be chosen from the reels or coils already selected under Scale A.

Note 2 — Scale A shall accept the lot with AQL 4.0 percent. Scale B shall accept the lot with AQL 1.0 percent.

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